OMRON

Ramp/Soak Process Controller

E5CK-T

Advanced, 1/16-DIN Ramp/Soak Process Controllers Ideal for Worldwide Use

- Offers one pattern of simple programming control, up to four patterns with communications (16 steps per pattern)
- Water-resistant front face meets IP66/NEMA 4 (indoor use)
- Modular structure, one-stock type
- Heat/Cool control
- Serial communications (RS-232C and RS-485)
- Temperature and analog inputs
- High-accuracy: 100 ms sampling (for analog input)
- Conforms to international EMC and safety standards
- 24V AC/DC type also available
- 3-year warranty

Ordering Information

Order control output boards and option boards separately. A single output board and option board can be mounted to each base unit. For example, for a relay control output, order the E53-R4 output board in addition to the E5CK-TAA1-500 Process Controller.

■ PROCESS CONTROLLERS

Description	DIN size	Supply voltage	**Part number**
Base unit with terminal cover	1/16 DIN (48 x 48 mm)	100-240 VAC	**E5CK-TAA1-500 AC100-240**
		24 VAC/VDC	**E5CK-TAA1-500 AC/DC24**

■ OPTIONAL OUTPUT BOARDS

Description	Specifications	Compatible controller	Max. quantity	**Part number**
Relay/Relay	SPST/SPST, 5 A, 250 VAC	E5CK-T	1	**E53-R4R4**
Relay/Pulse	SPST, 5 A/NPN, 24 VDC	E5CK	1	**E53-Q4R4**
	SPST, 5 A/PNP, 24 VDC	E5CK	1	**E53-Q4HR4**
Relay/Linear current	SPST, 5 A/4–20 mA	E5CK	1	**E53-C4R4**
	SPST, 5 A/0-20 mA	E5CK	1	**E53-C4DR4**
Relay/Linear voltage	SPST, 5 A/0-10 VDC	E5CK	1	**E53-V44R4**
Pulse/Pulse	NPN/NPN, 24 VDC	E5CK	1	**E53-Q4Q4**
	PNP/PNP, 24 VDC	E5CK	1	**E53-Q4HQ4H**
Computer communications	RS-232C	E5CK	1	**E53-CK01**
	RS-485	E5CK	1	**E53-CK03**
Event input	For remote set point	E5CK	1	**E53-CKB**
Transfer output	4 to 20 mA	E5CK	1	**E53-CKF**

Note: If the control period is less than 5 seconds, use an SSR (solid state relay) or pulse voltage output.

■ ACCESSORIES (ORDER SEPARATELY)

Description	Specifications	Compatible controller	Max. quantity	**Part number**
Current transformer; order only if using heater burnout alarm function	50 A load, 5.8 mm hole dia.	E5CK-T	1	**E54-CT1**
	120 A load, 12 mm hole dia.	E5CK-T	1	**E54-CT3**
Terminal cover (supplied with Standard models)	Provides finger protection from terminals (VDE0106 part 100)	E5CK-T	1	**E53-COV07**
Software	For setup and monitoring; requires optional computer communications board	All	1	**SYS-CONFIG V2.0**

Temperature Ranges

Platinum Resistance Thermometer

Input (switch selectable)		JPt100	Pt100
Range	°C	–199.9° to 650.0°	–199.9° to 650.0°
	°F	–199.9° to 999.9°	–199.9° to 999.9°
Resolution °C/°F (main setting and alarm)		0.1	0.1

Thermocouple

Input (switch selectable)		K1	K2	J1	J2	T	E	L1	L2	U	N	R	S	B	W	PLII
Range	°C	–200 to 1,300	0.0 to 500.0	–100 to 850	0.0 to 400.0	–199.9 to 400.0	0 to 600	–100 to 850	0.0 to 400.0	–199.9 to 400.0	–200 to 1,300	0 to 1,700	0 to 1,700	100 to 1,800	0 to 2,300	0 to 1,300
	°F	–300 to 2,300	0.0 to 900.0	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	0 to 1,100	–100 to 1,500	0.0 to 750.0	–199.9 to 700.0	–300 to 2,300	0 to 3,000	0 to 3,000	300 to 3,200	0 to 4,100	0 to 2,300
Resolution °C/°F (main setting, alarm)		1	0.1	1	0.1	0.1	1	1	0.1	0.1	1	1	1	1	1	1

Note: 1. Setting number is factory-set to 2 (K1).
2. Thermocouple W is W/Re 5-26 (tungsten rhenium 5, tungsten rhenium 26).

Current/Voltage

Input (switch selectable)	Current input		Voltage input		
	4 to 20 mA	0 to 20 mA	1 to 5 V	0 to 5 V	0 to 10 V
Range	One of following ranges depending on results of scaling –1999 to 9999 –199.9 to 999.9 –19.99 to 99.99 –1.999 to 9.999				
Resolution (main setting and alarm)	Depends on range selected				

Specifications

■ RATINGS

Model		E5CK-T (Standard)	E5CK-T (24 V Type)
Supply voltage		100 to 240 VAC, 50/60 Hz	24 VAC/VDC, 50/60 Hz
Power consumption		15 VA	6 VA, 3.5 W
Operating voltage range		85% to 110% of rated supply voltage	
Input	Thermocouple	K, J, T, E, L, U, N, R, S, B, W, PLII	
	Platinum resistance thermometer	JPt100, Pt100	
	Current input	4 to 20 mA, 0 to 20 mA	
	Voltage input	1 to 5 V, 0 to 5 V, 1 to 10 V	
Input impedance	Current input	150 Ω	
	Voltage input	1 MΩ min.	
Control output		According to Output Board (see *Output Board Ratings and Characteristics*)	
Auxiliary output		SPST-NO, 1 A at 250 VAC (resistive load)	
Control method		ON/OFF or advanced PID control	
Setting method		Digital setting using front panel keys or communications features	
Indication method		7-segment digital display and LEDs	
Additional functions	Standard	Manual output, heating/cooling control, SP limiter, loop burnout alarm, MV limiter, MV change rate limiter, input digital filter, input shift, run/reset, protect functions, scaling function	

■ CHARACTERISTICS

Indication accuracy (See Note 1)	Thermocouple	±0.3% of indication value or ±1°C, whichever greater, ±1 digit max.
	Platinum resistance thermometer	±0.2% of indication value or ±0.8°C, whichever greater, ±1 digit max.
	Analog input	±0.2% of indication value, ±1 digit max.
Hysteresis		0.01% to 99.99% FS (in units of 0.01% FS)
Proportional band (P)		0.1% to 999.9% FS (in units of 0.1% FS)
Integral (reset) time (I)		0 to 3,999 s (in units of 1 s)
Derivative (rate) time (D)		0 to 3,999 s (in units of 1 s)
Control period		1 to 99 s (in units of 1 s)
Manual reset value		0.0% to 100.0% (in units of 0.1%)
Alarm setting range		–1,999 to 9,999 or –199.9 or 999.9 (decimal point position dependent on input type)
Set time		0 to 99 hrs 59 min or 0 to 99 min 59 s
Program capacity		1 pattern, 16 steps (possible to use up to 4 patterns with the communications function.)
Programming method		Time or ramp setting method
Time accuracy		±0.2% (±500 ms) of the set value
Sampling period (See Note 2)	Temperature input	250 ms
	Analog input	100 ms
Insulation resistance		20 MΩ min. (at 500 VDC)
Dielectric strength		2,000 VAC, 50/60 Hz for 1 min between terminals of different polarities

(This table continues on the next page.)

Note: 1. The indication accuracy of the K1, T, and N thermocouples at a temperature of -100°C max. is ±2°C ±1 digit maximum. The indication accuracy of the U and L thermocouples at any temperature is ±2°C ±1 digit maximum.
The indication accuracy of the B thermocouple at a temperature of 400°C max. is unrestricted.
The indication accuracy of the R and S thermocouples at a temperature of 200°C max. is ±3°C ±1 digit maximum.
The indication accuracy of the W thermocouple at any temperature is (±0.3% of the indicated value or ±3°C, whichever is greater) ±1 digit maximum. The indication accuracy of the PLII thermocouple at any temperature is (±0.3% or ±2°C, whichever is greater) ±1 digit maximum.

2. The sampling period of the standard model with CT and remote SP inputs is 250 ms.

Characteristics Table – continued from previous page

Vibration resistance		Malfunction: 10 to 55 Hz, 10 m/s^2 (approx. 1G) for 10 min each in X, Y, and Z directions Destruction: 10 to 55 Hz, 20 m/s^2 (approx. 2G) for 2 hrs each in X, Y, and Z directions
Shock resistance		Malfunction: 200 m/s^2 min. (approx. 20G), 3 times each in 6 directions (100 m/s^2 (approx. 10G) applied to the relay) Destruction: 300 m/s^2 min. (30G), 3 times each in 6 directions
Ambient temperature	Operating	–10°C to 55°C (with no icing)/3-year warranty period: –10°C to 50°C
	Storage	–25°C to 65°C (with no icing)
Ambient humidity	Operating	35% to 85%
Enclosure ratings	Front panel	NEMA 4 for indoor use (equivalent to IP66)
	Rear case	IEC standard IP20
	Terminals	IEC standard IP00
Memory protection		Non-volatile memory (number of writings: 100,000 operations)
Weight		Approx. 170 g; Adapter: approx. 10 g
EMC		Emission Enclosure: EN55011 Group 1 class A Emission AC Mains: EN55011 Group 1 class A Immunity ESD: EN61000-4-2: 4kV contact discharge (level 2), 8kV air discharge (level 3) Immunity RF-interference: ENV50140: 10V/m (amplitude modulated, 80 MHz to 1 GHz) (level 3), 10 V/m (pulse modulated, 900 MHz) Immunity Conducted Disturbance: ENV50141: 10V (0.15 to 80 MHz) (level 3) Immunity Burst: EN61000-4-4: 2kV power-line (level 3), 2kV I/O signal-line (level 4)
Approved standards		UL1092, CSA22.2 No. 14, CSA22.2 No. 1010-1 Conforms to EN50081-2, EN50082-2, EN61010-1 (IEC1010-1) Conforms to VDE0106/part 100 (Finger Protection), when the separately-ordered terminal cover is mounted.

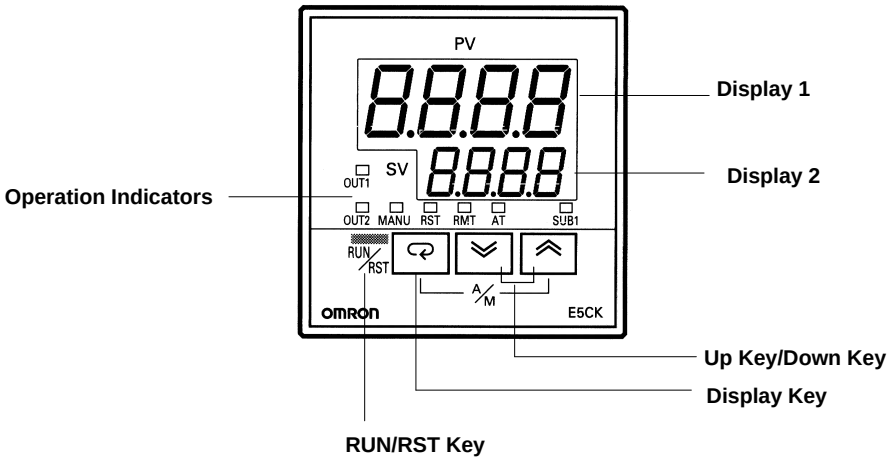
■ OPTION BOARD RATINGS AND CHARACTERISTICS

Model	Description		Specifications
E53-CKB	Event input		Contact input: ON: 1 kΩ max., OFF: 100 kΩ min. No-contact input: ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.
E53-CK01	Communications	RS-232C	Transmission method: Half-duplex Synchronization method: Start-stop synchronization (asynchronous method) Baud rate: 1.2/2.4/4.8/9.6/19.2 kbps
E53-CK03		RS-485	
E53-CKF	Transfer output		4 to 20 mA: Permissible load impedance: 500 Ω max. Resolution: approx. 2,600 steps

Note: Event input is used for switching the target value, run or stop command, or automatic and manual mode with an external signal input.

Nomenclature

■ E5CK-T



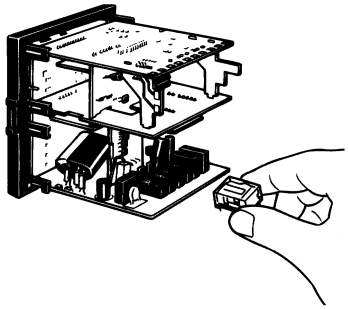
Operation

Note: Before changing any switch settings, always turn OFF the power supply to the Process Controller

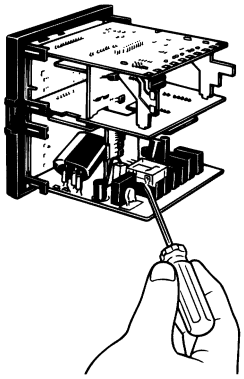
■ SETTINGS

1. On a standard model, set up the output boards for control outputs 1 and 2 before mounting the Controller.
2. On a position-proportional model, the relay output board is already set, so this setup operation is unnecessary. (Do not replace with other output boards.)
3. When setting up the output boards, remove the internal mechanism from the housing and insert the output boards into the sockets for control outputs 1 and 2.

Setting up the Output Board



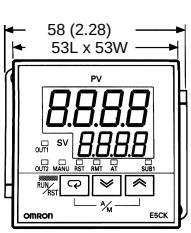
Removing the Output Board

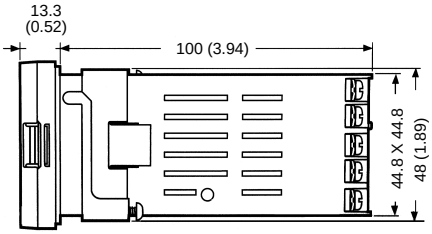


Dimensions

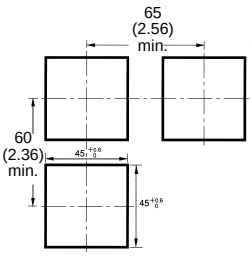
Unit: mm (inch)

■ E5CK-T





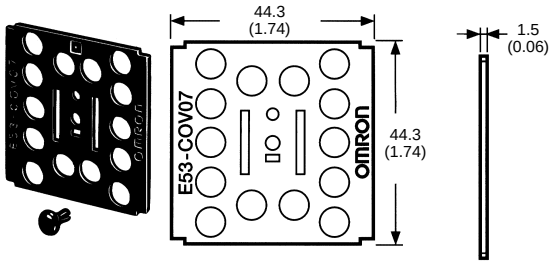
Panel Cutouts



■ ACCESSORIES (ORDER SEPARATELY)

Terminal Cover

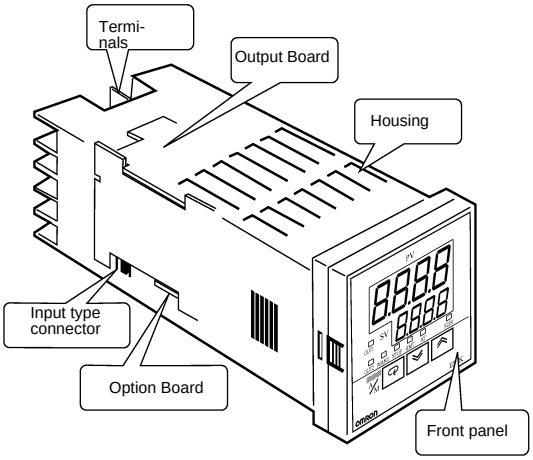
E53-COV07



Installation

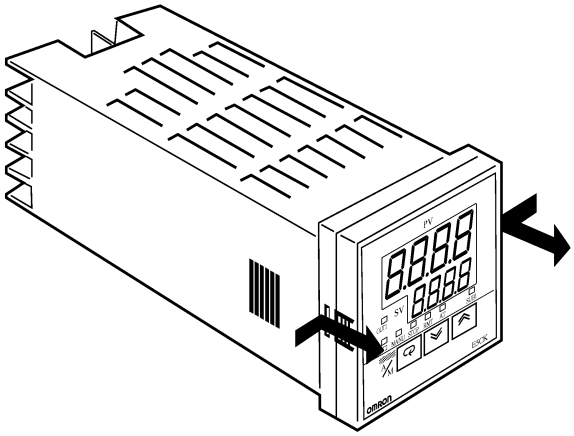
■ INSTALLATION

Main Parts



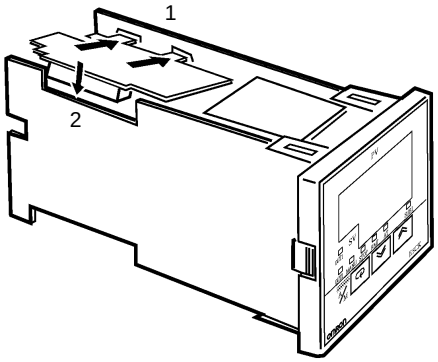
Removing Internal Mechanism

While pressing the hooks on the left and right sides of the front panel, carefully pull the internal mechanism from the housing. (Refer to the drawing below.)

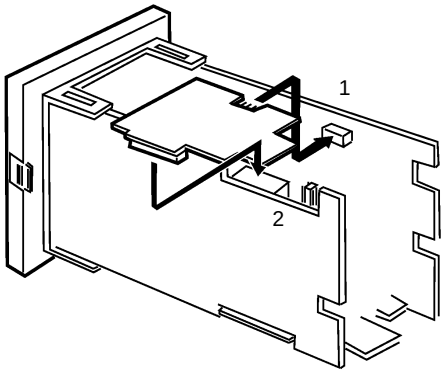


■ SETTING UP THE OUTPUT BOARD

1. Two rectangular holes are provided on the power board (right side of Controller). Fit the two protrusions of the output board into these two holes.
2. With the output board fitted into the power board, fit the output board into the connector on the control board (left side of Controller).

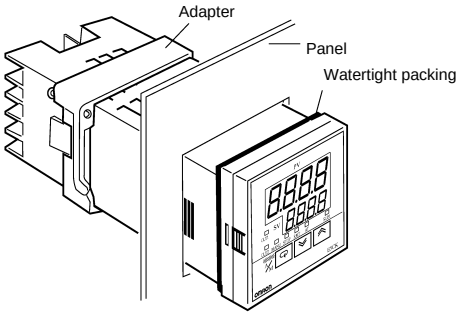


■ SETTING UP THE OPERATION BOARD



■ MOUNTING THE CONTROLLER

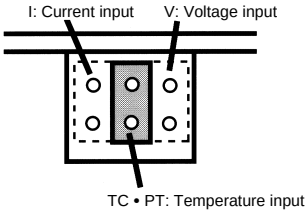
1. Insert the Controller into the panel's mounting hole at the position shown in the figure below.
2. Push the adapter along the Controller body from the terminals up to the panel, and fasten temporarily.
3. Tighten the two fixing screws on the adapter. When tightening screws, tighten the two screws alternately keeping the torque to approximately 0.29 to 0.39 N • m, or 3 to 4 kgf • cm.



Input Jumper Setting

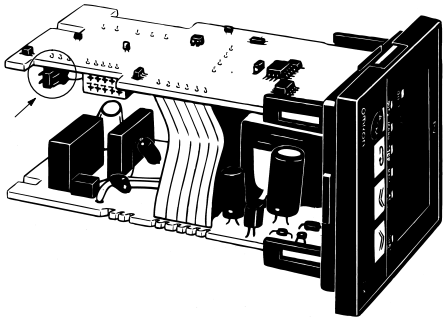
Note: The jumper is factory-set to TC • PT (temperature input).

Set the jumper to temperature, voltage, or current input according to the sensor connected to the input terminal.



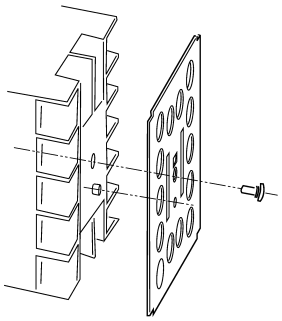
Note: Do not touch the pins of the jumper connector when setting the input type.

After setting the jumper, put on the housing, pressing the housing until the hooks of the front panel snap on.



Terminal Cover

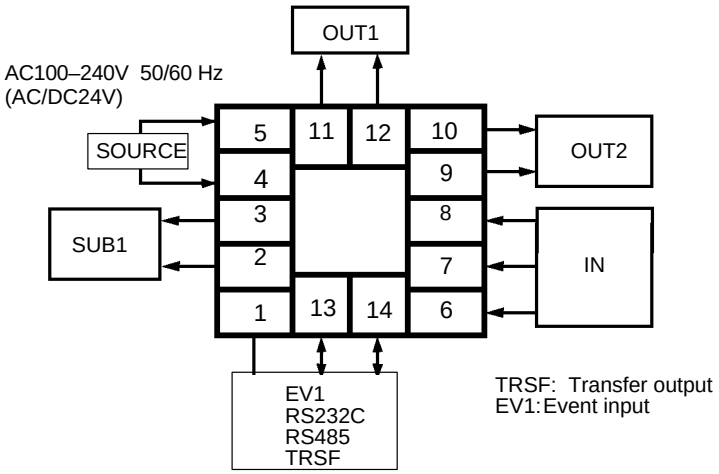
The E5CK-AA1-500 Controller is provided with a terminal cover E53-COV07. Fasten the terminal cover as follows by using the snap pin.



■ WIRING TERMINALS

Terminal Arrangement

E5CK-T



■ WIRING PRECAUTIONS

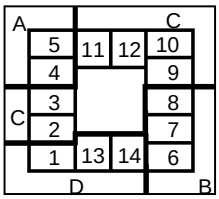
- Use ducts to separate input leads and power lines in order to protect the Controller and its lines from external noise.
- Solderless terminals are recommended when wiring the Controller.
- Tighten the terminal screws using a torque no greater than 0.78 N • m, or 8 kgf • cm max. Be careful not to tighten the terminal screws too tightly.

Power Blocks for E5CK–T

The E5CK-T has independent power supplies for each of the terminal blocks shown below.

Note: The power supplies for blocks C (exclude relay output) and D are shared for the following option board:
E53-CKB or E53-CKF Option Board

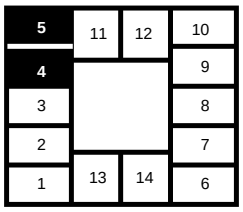
E5CK-T



■ E5CK-T WIRING

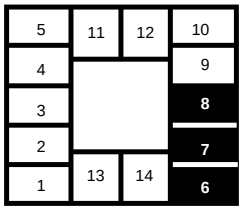
Power Supply

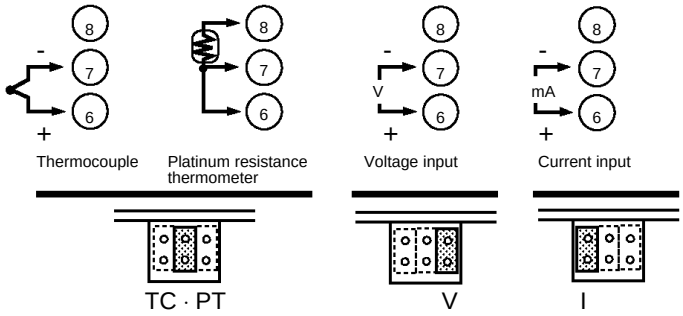
Input 100 to 240 VAC or AC/DC 24 V to terminal numbers 4 and 5 according to the specification.



Input

Connect the input to terminal numbers 6 to 8 as follows according to the input type.

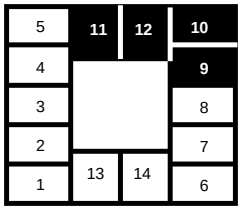


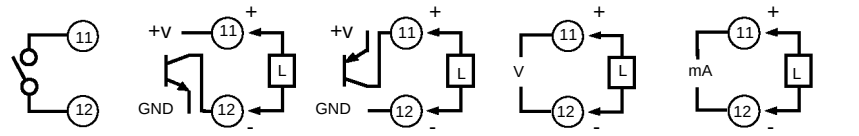


Match the inputs with the internal jumper settings for each input type. For thermocouple or platinum resistance thermometer inputs, set the inputs to a common position (TC/PT) as the temperature input.

Control Output

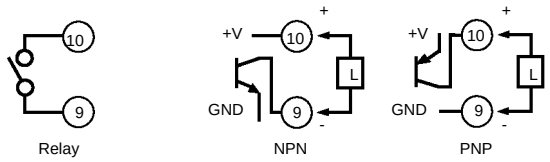
Terminal numbers 11 and 12 are for control output 1 (OUT1). The five output types and internal equalizing circuits are available according to the output board.





Relay	NPN	PNP	0 to 10 V	4 to 20mA
E53-R4R4	E53-Q4R4 E53-Q4Q4	E53-Q4HR4 E53-Q4HQ4H	E53-V44R4	E53-C4R4 E53-C4DR4

Terminal numbers 9 and 10 are for control output 2 (OUT2). The three output types and internal equalizing circuits are available according to the output board.



Relay	NPN	PNP
E53-R4R4 /E53-V44R4 E53-Q4R4 /E53-C4R4 E53-Q4HR4/E53-C4DR4	E53-Q4Q4	E53-Q4HQ4H

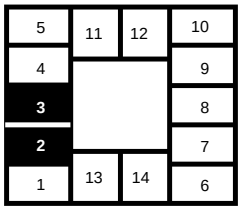
Specifications for Each Type of Output

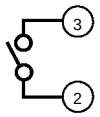
Output type	Specifications
Relay Voltage (NPN) Voltage (PNP)	3 A at 250 VAC 20 mA at 12 VDC (with short-circuit protection) 20 mA at 12 VDC (with short-circuit protection)
0 to 10 V 4 to 20 mA	0 to 10 VDC, permissible load impedance: 1 kΩ min., resolution: approx. 2,600 4 to 20 mA, permissible load impedance: 500 Ω max., resolution: approx. 2,600

Auxiliary Output 1

Terminal numbers 2 and 3 are for auxiliary output 1 (SUB1).

The internal equalizing circuit for auxiliary output 1 is as follows:



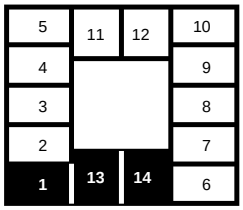


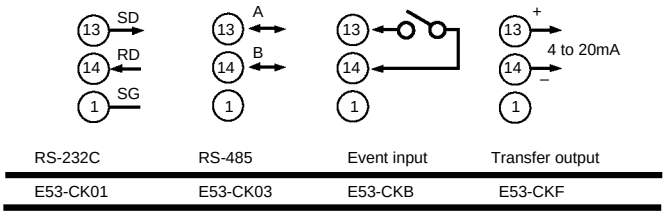
Relay specifications are as follows: SPST-NO, 250 VAC, 1 A

Option

Terminal numbers 1, 13, and 14 are valid only when the option board is set in the Controller.

The following four connections are possible depending on the model of the option board.

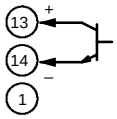




Use event inputs under the following conditions:

Contact input	ON: 1 kΩ max., OFF: 100 kΩ min.
No-contact input	ON: residual voltage 1.5 V max., OFF: leakage current 0.1 mA max.

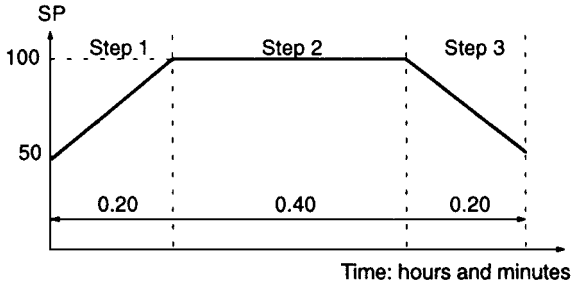
The polarity for no-contact input is as follows:



Transfer output specifications are as follows: 4 to 20 mA, load: 500 Ω max., resolution approx. 2600

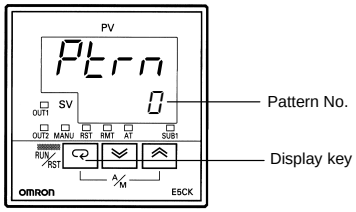
Quick Setup Instructions

The following procedure writes a simple program to Pattern 0.

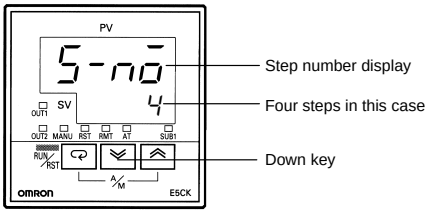


Step number	Target set point value	Time (hours.minutes)
0	50	0.00
1	100	0.20
2	100	0.40
3	50	0.20

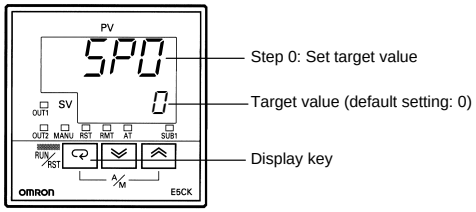
1. Press the Display Key to shift to the display for the number of steps.



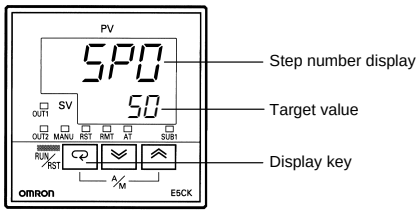
2. Press the Down Key and set the number of steps.



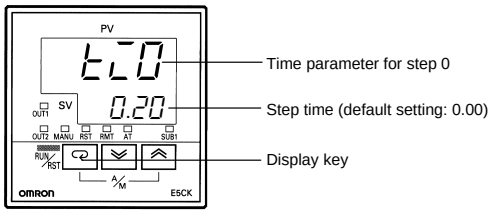
3. Press the Display Key to shift to the display for the target value of step 0.



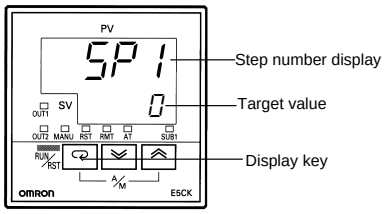
4. Set the target value to “50.”



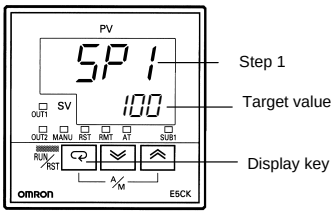
5. Press the Display Key to shift to the display for the time of Step 0.



6. Press the Display Key again with the step time set at 0 minutes, and the target value parameter for Step 1 will be displayed.



7. Press the UP Key to increment to “100.”



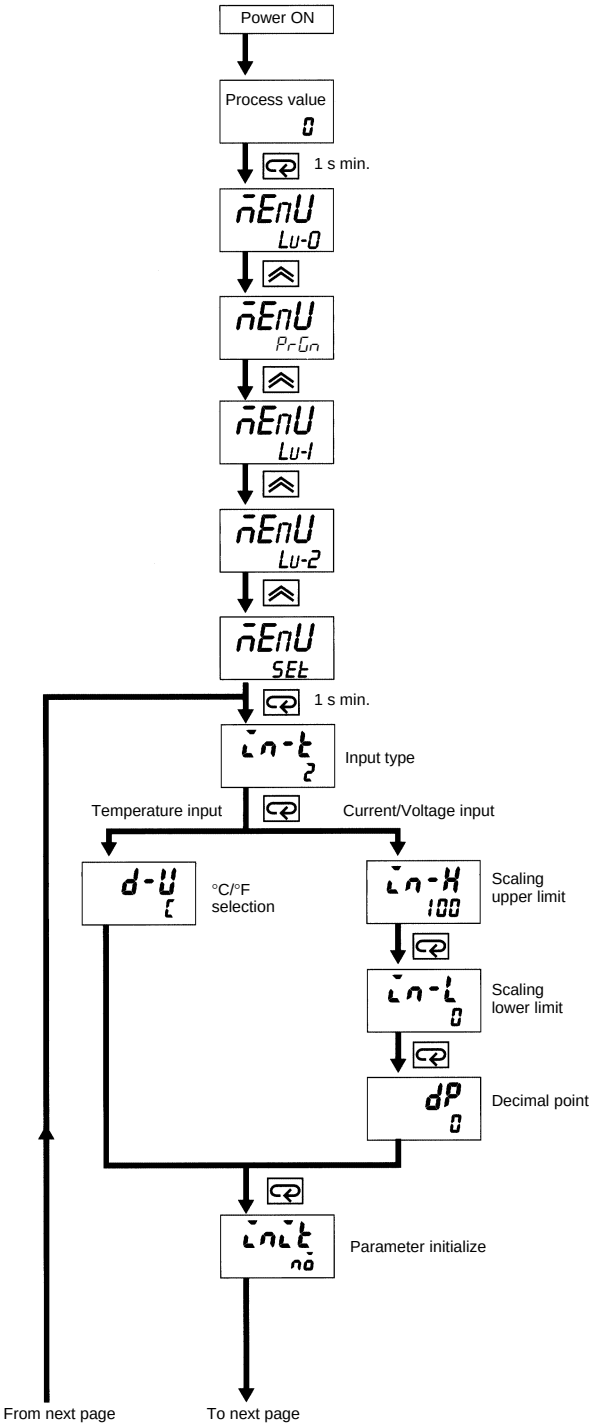
8. In the same manner, set the time for Step 1, target value for Step 2, time for Step 2, etc.

9. When the target value and time settings are complete, press the Display Key.

Note: For more details about programming refer to the *E5CK-T User’s Manual, H090-E3-1*.

■ AFTER TURNING POWER ON

Determine the I/O specifications of the Process Controller in setup mode.



■ INPUT TYPE

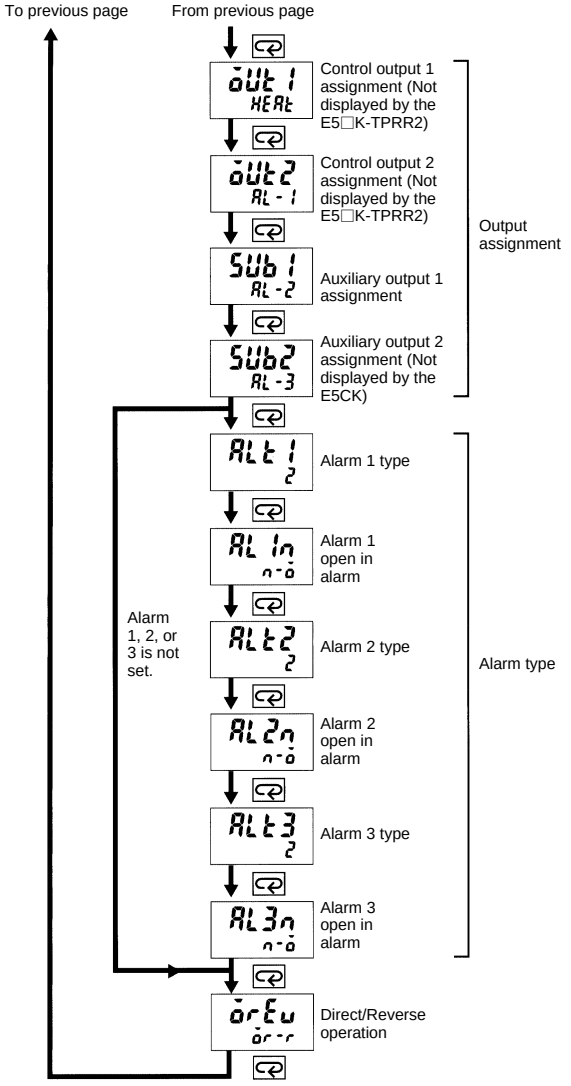
Set the code according to the following table. Default is "2: K1 thermocouple."

Platinum Resistance Thermometer

Set value	Input type		
0	JPt100	–199.9 to 650.0 (°C) /–199.9 to 999.9 (°F)	Platinum resistance thermometer
1	Pt100	–199.9 to 650.0 (°C) /–199.9 to 999.9 (°F)	
2	K1	–200 to 1,300 (°C) /–300 to 2,300 (°F)	Thermocouple
3	K2	0.0 to 500.0 (°C) /0.0 to 900.0 (°F)	
4	J1	–100 to 850 (°C) /–100 to 1,500 (°F)	
5	J2	0.0 to 400.0 (°C) /0.0 to 750.0 (°F)	
6	T	–199.9 to 400.0 (°C) /–199.9 to 700.0 (°F)	
7	E	0 to 600 (°C) /0 to 1,100 (°F)	
8	L1	–100 to 850 (°C) /–100 to 1,500 (°F)	
9	L2	0.0 to 400.0 (°C) /0.0 to 750.0 (°F)	
10	U	–199.9 to 400.0 (°C) /–199.9 to 700.0 (°F)	
11	N	–200 to 1,300 (°C) /–300 to 2,300 (°F)	
12	R	0 to 1,700 (°C) /0 to 3,000 (°F)	
13	S	0 to 1,700 (°C) /0 to 3,000 (°F)	
14	B	100 to 1,800 (°C) /300 to 3,200 (°F)	
15	W	0 to 2,300 (°C) /0 to 4,100 (°F)	
16	PLII	0 to 1,300 (°C) /0 to 2,300 (°F)	
17	4 to 20 mA		Current input
18	0 to 20 mA		
19	1 to 5 V		Voltage input
20	0 to 5 V		
21	0 to 10 V		

■ PARAMETER INITIALIZE

Parameter initialization sets all parameters to default values except for the input type, scaling upper limit, scaling lower limit, decimal point, and °C/°F selection parameters.


To previous page
From previous page
Control output 1 assignment (Not displayed by the E5□K-TPRR2)
Control output 2 assignment (Not displayed by the E5□K-TPRR2)
Output assignment
Auxiliary output 1 assignment
Auxiliary output 2 assignment (Not displayed by the E5CK)
Alarm 1 type
Alarm 1 open in alarm
Alarm 2 type
Alarm 2 open in alarm
Alarm 3 type
Alarm 3 open in alarm
Alarm type
Alarm 1, 2, or 3 is not set.
Direct/Reverse operation

■ OUTPUT ASSIGNMENTS

Signals available as allocated outputs are the control output (heat), control output (cool), alarm 1, alarm 2, alarm 3, LBA. The auxiliary outputs of the Process Controller cannot be used as control outputs. The E5CK-T does not have a heater burnout alarm (HBA).

Control output (heat), control output (cool), alarm 1, alarm 2, alarm 3, LBA, error 1 (input error), and error 2 (A/D converter error) output functions are available. These functions are assigned to control outputs 1 and 2 and auxiliary outputs 1 and 2.

The assignment destination of each output function is restricted. Refer to the tables provided under the headings, *Standard Models and Position-Proportionate Models.*

■ STANDARD MODELS

Assignment destination	Control output		Auxiliary output
	1	2	1
Control output (heat)	Yes	Yes	---
Control output (cool)	Yes	Yes	---
Alarm 1	Yes	Yes	Yes
Alarm 2	Yes	Yes	Yes
Alarm 3	Yes	Yes	Yes
LBA	Yes	Yes	Yes
Error 1: Input error	---	---	Yes
Error 2: A/D converter error	---	---	Yes

With control output (cool), the conditions for switching from standard control to heating and cooling control are reached when the output function is assigned at the cooling side during heating and cooling control.

In other words, heating and cooling control is carried out when control output (cool) is assigned, and standard control is carried out when output is not assigned.

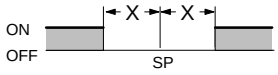
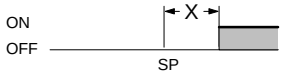
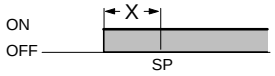
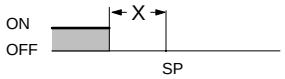
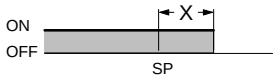
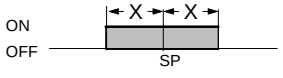
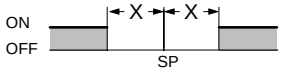
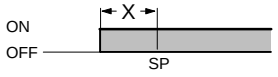
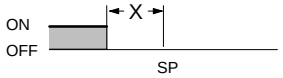
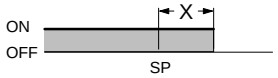
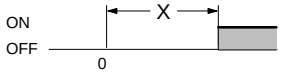
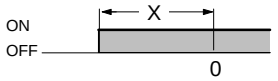
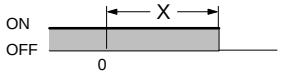
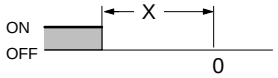
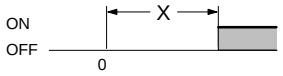
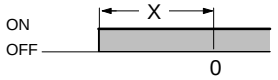
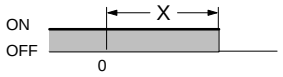
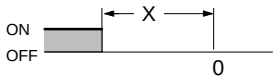
LBA

The LBA (loop break alarm) function is available when it is assigned as an output. The LBA function is not available when a memory or A/D converter error results.

LBA is a function for determining that an error has occurred somewhere on the control loop and outputting an alarm when the process value does not change with the manipulated variable at a maximum or minimum state. Accordingly, the LBA function can be used as a means for detecting a malfunctioning control loop.

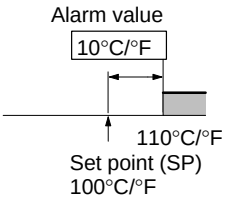
■ ALARM MODE SELECTORS

Alarm outputs are available if they are allocated as outputs. Factory setting is “2: Upper-limit alarm (deviation).”

Switch setting	Alarm operation	Alarm output	
		When X is positive	When X is negative
1	Upper- and lower-limit alarm (deviation)		Always ON
2	Upper-limit alarm (deviation)		
3	Lower-limit alarm (deviation)		
4	Upper- and lower-limit range alarm (deviation)		Always OFF
5	Upper- and lower-limit alarm with standby sequence (deviation)		Always OFF
6	Upper-limit alarm with standby sequence (deviation)		
7	Lower-limit alarm with standby sequence (deviation)		
8	Absolute-value upper-limit alarm		
9	Absolute-value lower-limit alarm		
10	Absolute-value upper-limit alarm with standby sequence		
11	Absolute-value lower-limit alarm with standby sequence		

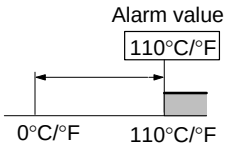
Deviation Alarm

If the alarm mode selector is set to a number between 1 and 7, alarm values are set to the width deviated from the set point as shown in the following illustration.



Absolute Alarm

If the alarm mode selector is set to 8 or 9, alarm values are set to the absolute value based on 0°C/°F as shown in the following illustration.



■ CLOSE IN ALARM/OPEN IN ALARM

When the Controller is set to “close in alarm,” the status of the alarm output function is output as it is. When set to “open in alarm,” the status of the alarm output function is output inverted.

Condition	Alarm	Output	Output LED
Close in alarm	ON	ON	Lit
	OFF	OFF	Not lit
Open in alarm	ON	OFF	Lit
	OFF	ON	Not lit

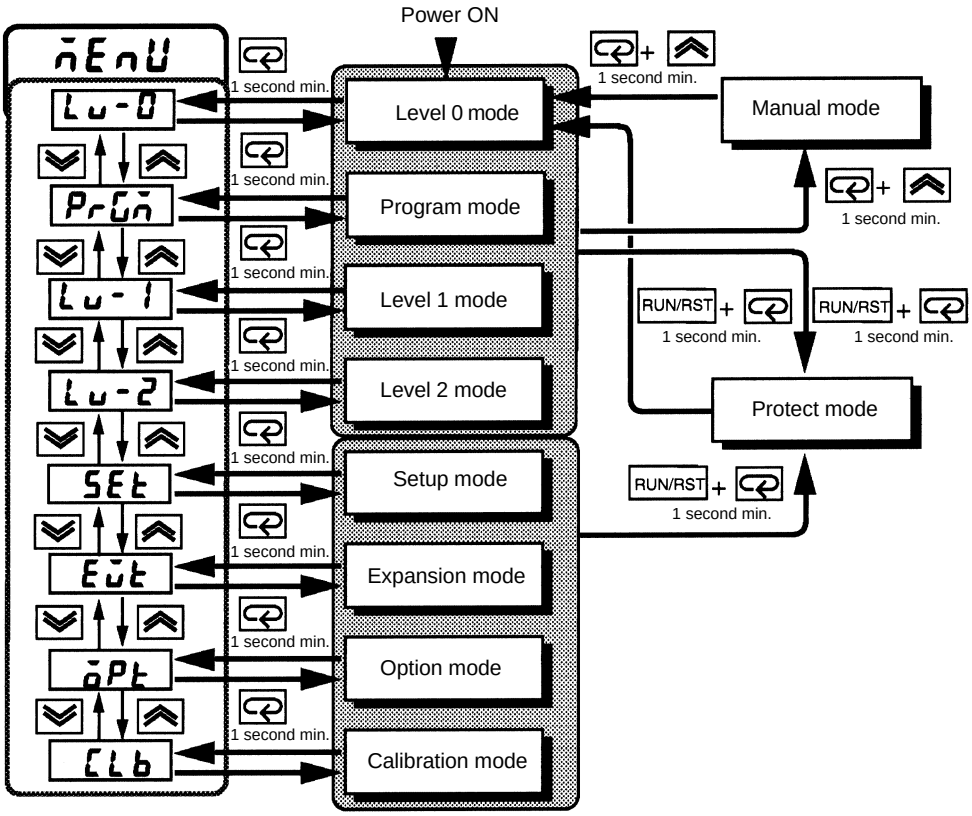
Alarm type and close in alarm (normally open)/open in alarm (normally close) can be set independently from each alarm.

Close in alarm/Open in alarm is set in the “alarm 1 to 3 open in alarm” parameters (setup mode).
Factory setting is “close in alarm” [n-o].

■ PARAMETER OPERATION LIST

Switching to modes other than manual or protect mode is carried out using the mode selection in the menu display.

The figure below shows all parameters in the order that they are displayed. Some parameters are not displayed depending on the protect mode setting and conditions of use.



■ PARAMETERS AND MENUS

All functions selected with the Controller in setup or expansion mode or all optional functions of the Process Controller may not be displayed.

Note: All references to Heater Burnout Alarm Function and “position-proportional” apply only to E5EK/AK-T and are not applicable to E5CK-T.

Protect Mode

The protect function is for preventing unwanted modification of parameters and switching between run and reset operation or auto and manual operation.

Manual Mode

In this mode, the Controller can be switched to manual operation. The manipulated variable can be manipulated manually only in this mode.

Level 0 Mode

Set the Controller to this mode during normal operation. In this mode, you can change the set point and pattern during operation, and execute step operation (e.g. advance). You can only monitor (not change) the process value, step No., standby time, pattern elapsing time, pattern execution count, and manipulated variable.

Program Mode

This is the programming mode. In this mode, you can set the number of steps used in each pattern, pattern execution count, alarm values, set points for each step, step time, and time signals for two steps.

Level 1 Mode

This is the main mode for adjusting control. In this mode, you can execute AT (auto-tuning), set up the control period, change PID parameters, and set alarm values.

Level 2 Mode

This is the auxiliary mode for adjusting control. In this mode, you can set the parameters for limiting the manipulated variable, switch between the remote and local modes, and set the loop break alarm (LBA), alarm hysteresis, and the digital filter value of inputs.

Setup Mode

This is the mode for setting the basic specifications. In this mode, you can set parameters that must be checked or set before an operation such as the input type, scaling, output assignments, and direct/reverse operation.

Expansion Mode

This is the mode for setting expanded functions. In this mode, you can set SP setting limiter, switching between advanced PID control or ON/OFF control, program time unit, selection of step time/rate of rise, time unit of ramp rise rate, and the time for automatic return to the monitoring display.

Option Mode

This is the mode for setting optional functions. You can select this mode only when an option board is mounted in the Controller. In this mode, you can set the communications conditions, transfer output and event input parameters to match the type of option board mounted in the Controller.

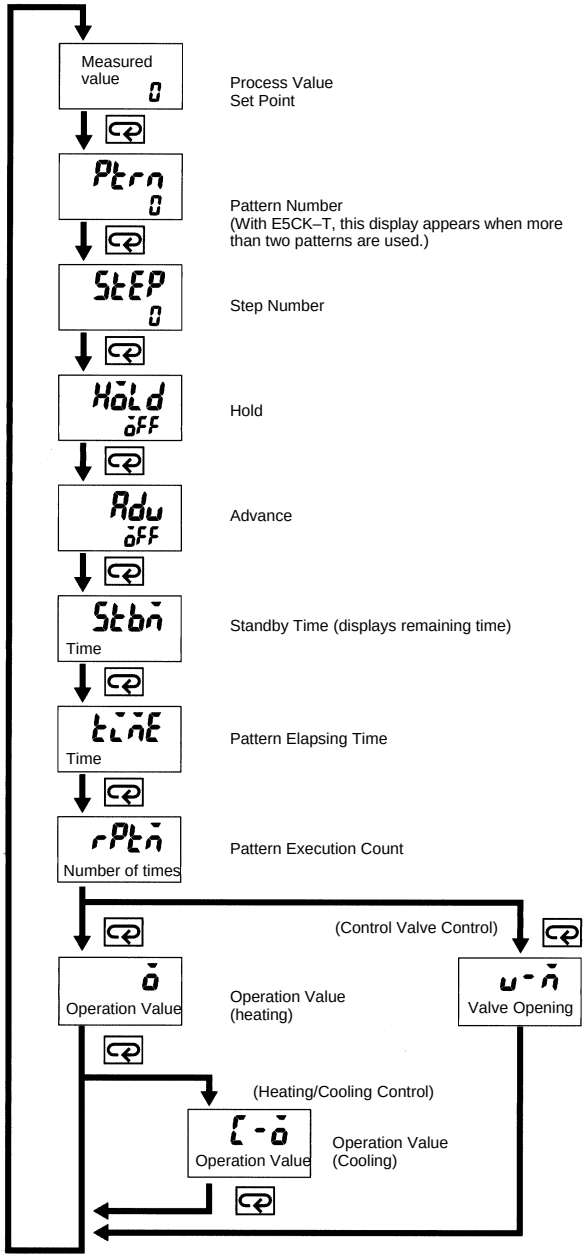
Calibration Mode

This mode is provided so that the user can calibrate inputs and output. When calibrating input, the selected input type is calibrated. Whereas, transfer output can be calibrated only when the communications board (E53-CKF) is set in the Controller.

■ PARAMETER OPERATION

Refer to “Settings” in the *Operation Section*.

Level 0 Mode



PV/SP

The process value is displayed on the No.1 display and the set point is displayed on the No.2 display.

When the multi-SP function is in use, the value of whichever is set, set point 0 or 1, is linked.

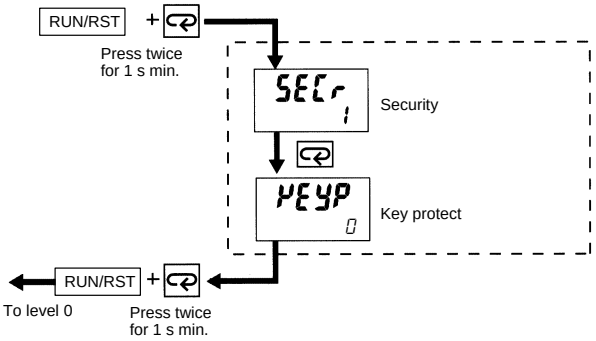
Remote SP Monitor

Monitors remote SP in the local SP mode.

Set Point During SP Ramp

Monitors the set point when the SP ramp function is used.

■ PROTECT MODE



Security

Any mode marked with “X” in the following table is not displayed on the menu when this parameter is set to “0” to “3.”

Mode	Set value				
	0	1	2	3	4
Calibration	---	x	x	x	x
Option	---	---	x	x	x
Expansion	---	---	x	x	x
Setup	---	---	x	x	x
Level 2	---	---	---	x	x
Level 1, 0	---	---	---	---	x

The Unit will be in only level 0 mode and the menu will not be available when this parameter is set to “4” to “6.”

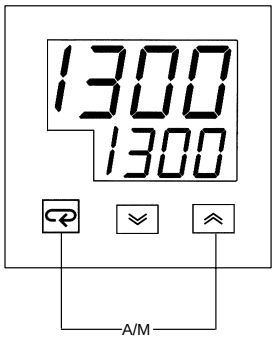
Only the “PV/SP” parameter in the level 0 mode can be used when this parameter is set to “5.”

Only the “PV/SP” parameter in the level 0 mode can be used when this parameter is set to “6.”

Key Protect

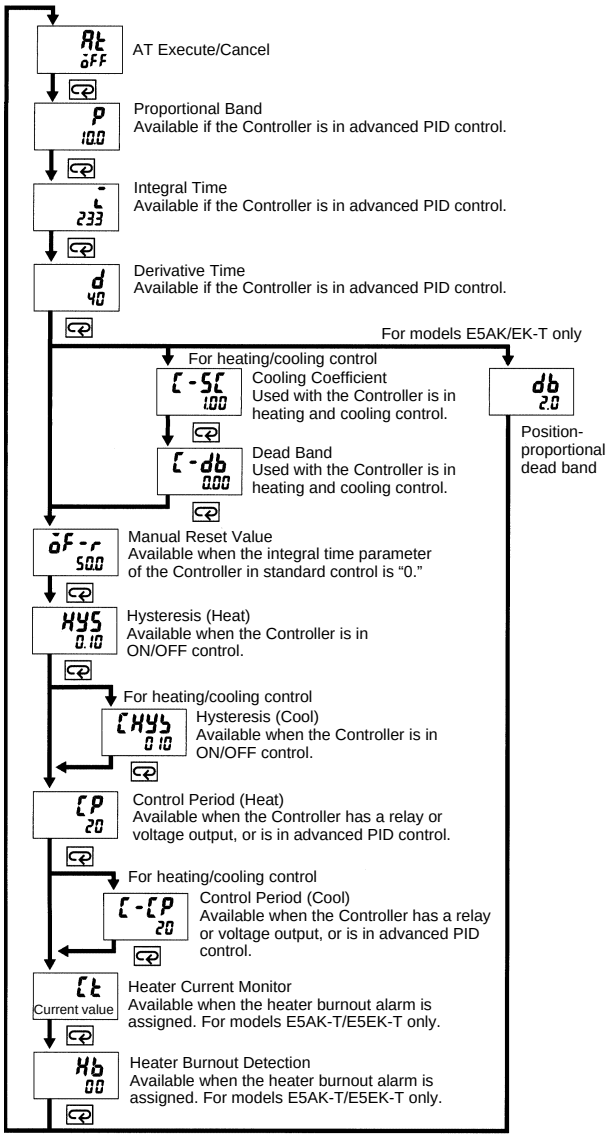
Invalidate the automatic, manual, run, and reset functions.

■ MANUAL MODE

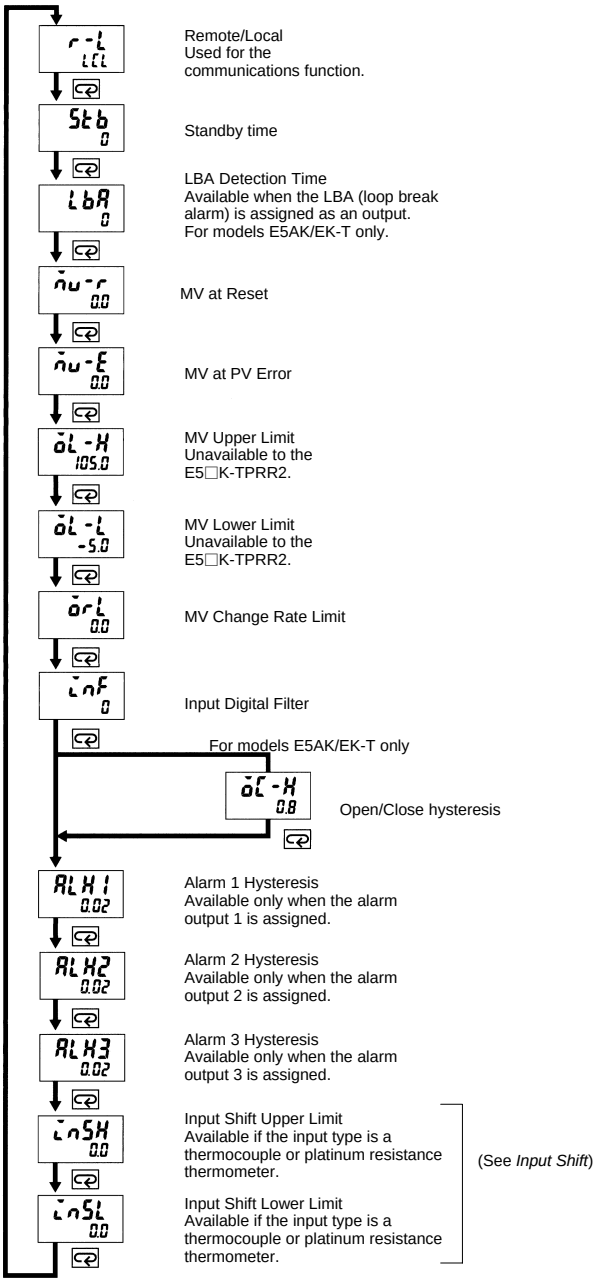


Press both simultaneously for more than 1 second to switch between auto or manual.

■ LEVEL 1 MODE


AT Execute/Cancel
Proportional Band
Available if the Controller is in advanced PID control.
Integral Time
Available if the Controller is in advanced PID control.
Derivative Time
Available if the Controller is in advanced PID control.
For models E5AK/EK-T only
For heating/cooling control
Cooling Coefficient
Used with the Controller is in heating and cooling control.
Position-proportional dead band
Dead Band
Used with the Controller is in heating and cooling control.
Manual Reset Value
Available when the integral time parameter of the Controller in standard control is "0."
Hysteresis (Heat)
Available when the Controller is in ON/OFF control.
For heating/cooling control
Hysteresis (Cool)
Available when the Controller is in ON/OFF control.
Control Period (Heat)
Available when the Controller has a relay or voltage output, or is in advanced PID control.
For heating/cooling control
Control Period (Cool)
Available when the Controller has a relay or voltage output, or is in advanced PID control.
Current value
Heater Current Monitor
Available when the heater burnout alarm is assigned. For models E5AK-T/E5EK-T only.
Heater Burnout Detection
Available when the heater burnout alarm is assigned. For models E5AK-T/E5EK-T only.

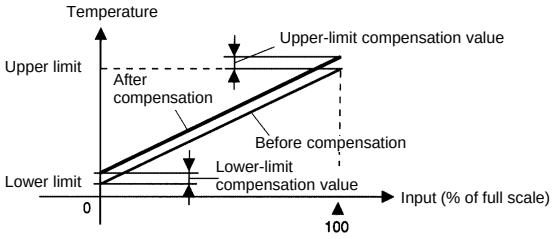
■ LEVEL 2 MODE



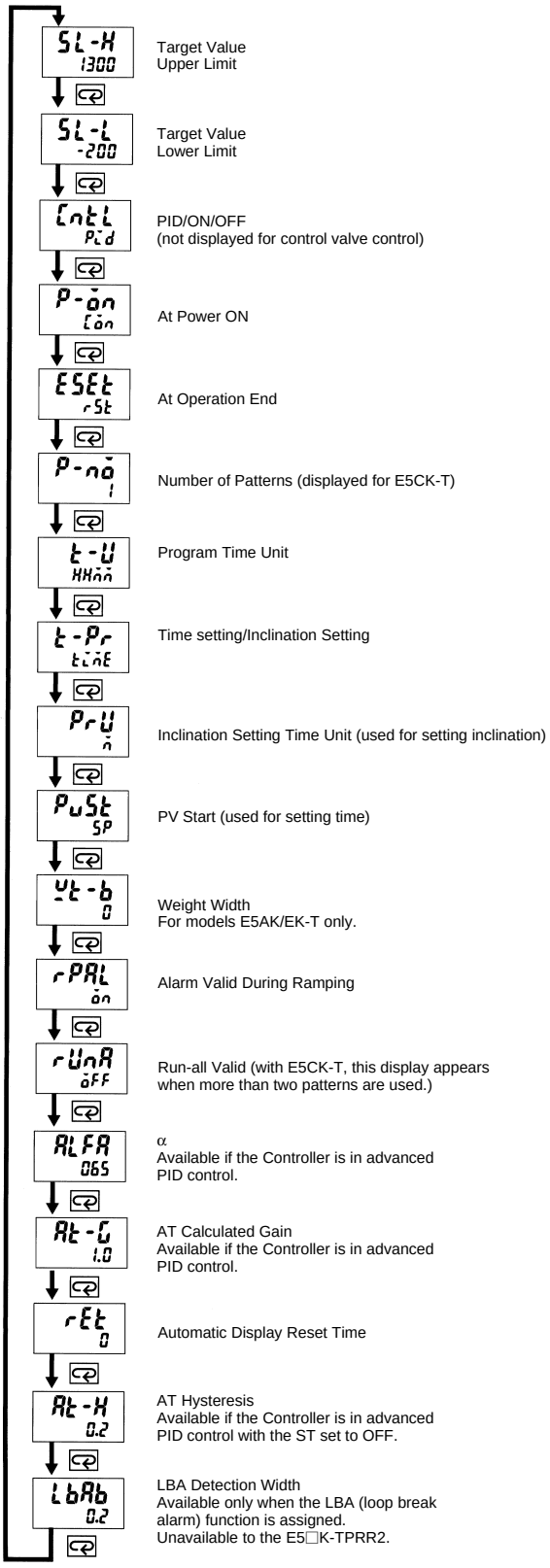
Input Shift

When temperature input is selected, scaling is not required. This is because input is treated as the “temperature” as it is matched to the input type. However, note that the upper- and lower-limit values of the sensor can be shifted. For example, if both the upper- and lower-limit values are shifted by 1.2°C, the process value (before shift) is regarded as 201.2°C after shift when input is 200°C before shift.

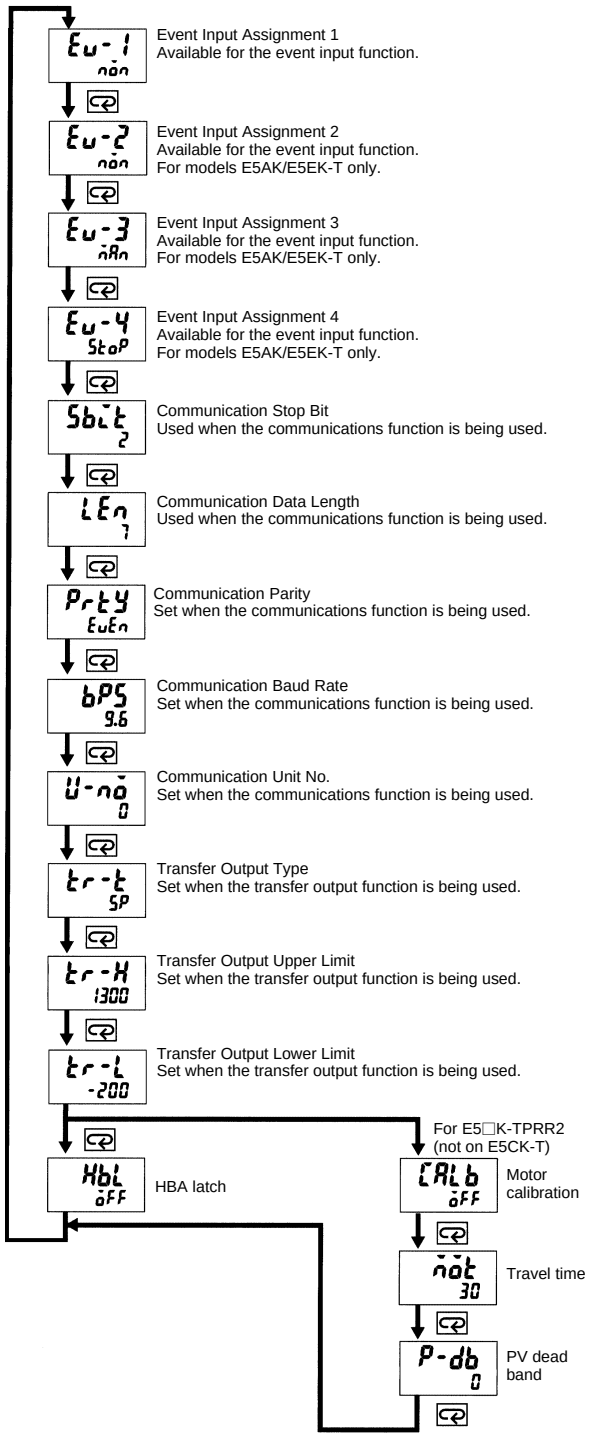
To set the input shift, set shift values in the “input shift upper limit” and “input shift lower limit” parameters (level 2 mode).



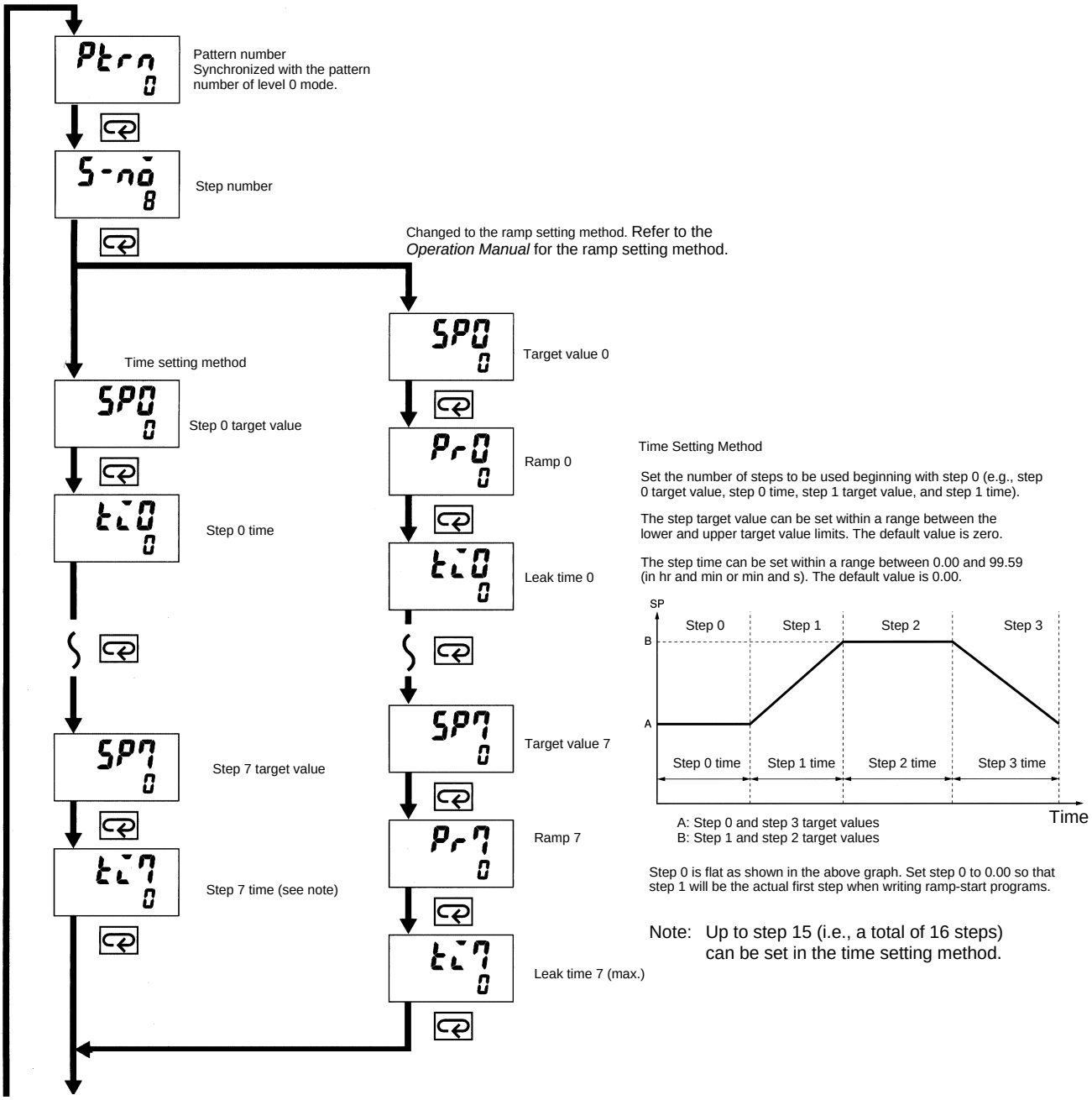
■ EXPANSION MODE



■ OPTION MODE



■ PROGRAM MODE



Time Setting Method

Set the number of steps to be used beginning with step 0 (e.g., step 0 target value, step 0 time, step 1 target value, and step 1 time).

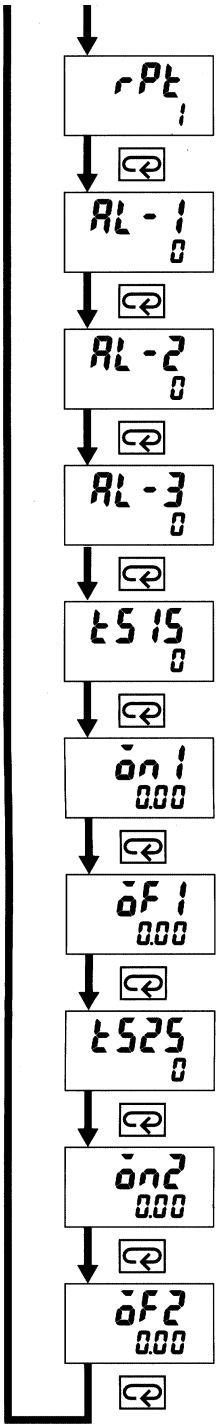
The step target value can be set within a range between the lower and upper target value limits. The default value is zero.

The step time can be set within a range between 0.00 and 99.59 (in hr and min or min and s). The default value is 0.00.

A: Step 0 and step 3 target values
B: Step 1 and step 2 target values

Step 0 is flat as shown in the above graph. Set step 0 to 0.00 so that step 1 will be the actual first step when writing ramp-start programs.

Note: Up to step 15 (i.e., a total of 16 steps) can be set in the time setting method.



Number of patterns executed

Alarm value 1 (displayed only if the alarm is allocated)

Alarm value 2 (displayed only if the alarm is allocated)

Alarm value 3 (displayed only if the alarm is allocated)

Time signal 1 setting step

Time signal 1 ON time

Time signal 1 OFF time

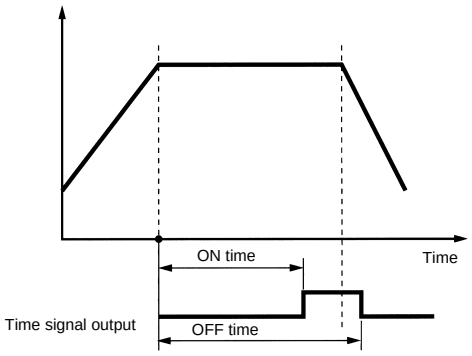
Time signal 2 setting step

Time signal 2 ON time

Time signal 2 OFF time

Time Signal

Two types of time signal patterns can be set in each pattern.



Two types of time signal timers are available (i.e., ON-time and OFF-time use), each of which starts with the edge of the step.

The output is ON from the moment the ON time elapses until the OFF time elapses.

Set the step so that the time signal is triggered by the time signal 1/2 setting step parameters. The default is step 0.

Set the ON/OFF timing with the timing signal 1/2 ON-time and time signal 1/2 OFF-time parameters in Program mode.

ON Conditions

If the ON time is shorter than the OFF time, the signal will be reset or ON after the ON time elapses until the next pattern starts.

The signal is not ON if there is no difference in period between the ON time and OFF time.

If ADVANCE is executed while the time signal setting step is executed, the time equivalent to the setting step will be deemed to have elapsed. In the above graph, for example, the signal is ON from the edge of the next step until the OFF time elapses.

■ HOW TO USE THE ERROR DISPLAY

When an error has occurred, the No.1 display alternately indicates error codes together with the current display item.
This section describes how to check error codes on the display, and the actions that must be taken to remedy the problem.

S.Err Input Error

Meaning Input is in error.

Action Check the wiring of inputs, disconnections, and shorts, and check the input type and the input type jumper connector.

Operation at Error For control output functions, output the manipulated variable matched to the setting of the “MV at PV error” parameter (level 2 mode). Alarm output functions are activated when the upper limit is exceeded.

E111 Memory Error

Meaning Internal memory operation is in error

Action First, turn the power OFF then back ON again. If the display remains the same, the E5□K-T Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.

Operation at Error Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

E333 A/D Converter Error

Meaning Internal circuits are in error.

Action First, turn the power OFF then back ON again. If the display remains the same, the E5□K-T Controller must be repaired. If the display is restored to normal, the probable cause may be external noise affecting the control system. Check for external noise.

Operation at Error Control output functions turn OFF (2 mA max. at 4 to 20 mA output, and output equivalent to 0% in case of other outputs). Alarm output functions turn OFF.

R.Err Calibration Data Error

This error is output only during temperature input and is displayed for two seconds when the power is turned ON.

Meaning Calibration data is in error.

Action Must repair.

Operation at Error Both control output functions and alarm output functions are active. However, note that the readout accuracy is not assured.

Display Range Over

Meaning

Though not an error, this is displayed when the process value exceeds the display range when the control range (setting range ±10%) is larger than the display range (–1999 to 9999).

- When less than "–1999"
- When greater than "9999"

Operation

Control continues, allowing normal operation.

Motor Calibration Error (Displayed on the No. 2 Display)

Meaning

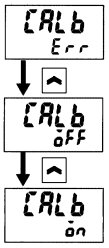
Motor calibration has ended with an error.

Action

First, correctly connect the wiring for the potentiometer, open output, and close output.

Execute the motor calibration again.

Operation Procedure



Operation at Error

When motor calibration is executed, open output will operate and then close output will operate. However, as the value is incorrect, the result turns out to be an error.

Precautions

■ OPERATING ENVIRONMENT

- Operate the Controller within the rated ambient operating temperature, ambient operating humidity, and storage temperature ranges.
- Use the Controller according to the vibration resistance, shock resistance, and enclosure ratings.
- Do not install the Controller in places with corrosive gas or excessive dust.
- Do not install the Controller near machines generating high-frequency noise.

■ MOUNTING

- The dimensions of the Controller conform to DIN 43700.
- Recommended panel thickness is 1 to 8 mm.
- Mount the Unit horizontally.

■ CONNECTION

- To reduce inductive noise influence, the lead wires connecting the input type to the Controller must be separated from the power lines and load lines.
- Use the specified compensating conductors for thermocouples. Use lead wires having a small resistance for platinum resistance thermometers.

■ CONNECTION EXAMPLE

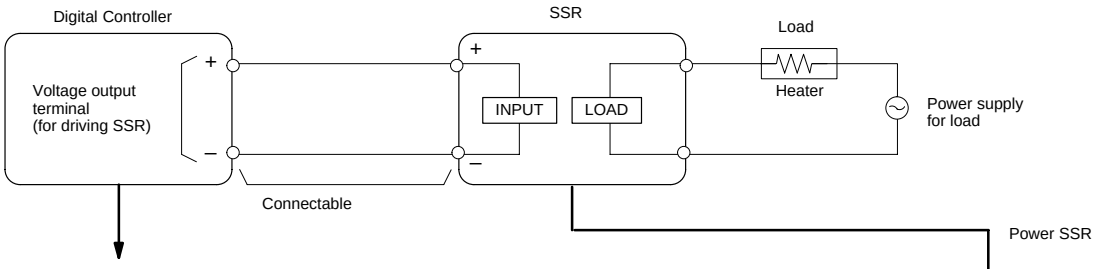
- Wire the terminals of the Unit using solderless terminals.
- The tightening torque applied to the terminal screws of the Unit must be approximately 0.78 N • m or 8 kgf • cm.
- Use the following type of solderless terminals for M3.5 screws.

■ OPERATION

- The alarm outputs of a model with an alarm function may not turn ON correctly when the model malfunctions. The use of alarm equipment with the Controller is recommended.
- The parameters and internal switch are set before shipping so that the Unit will function normally. Change the settings of the parameters and internal switch according to the application if necessary.
- After power has been supplied to the Controller, several seconds are required until the relay is turned ON. Consider this time delay when designing sequenced circuits which incorporate a Controller.
- Do not use excessive force when removing the internal mechanism from the housing. Protect the internal connector or electronic parts of the Unit from shock.
- Protect against static discharge when changing the settings of the internal switch. Changing the settings on a grounded conductive mat is recommended.
- When connecting the control output board to the Temperature Controller or Process Controller, make sure that the control output board is the appropriate type, or the system may malfunction.

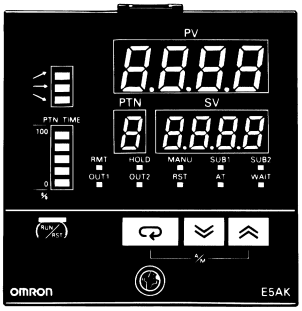
■ SSR

Connection Example of Process Controller and SSR



E5□K-T

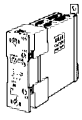
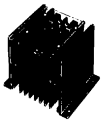
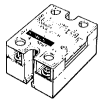
Process Controller with Voltage Output (12 VDC, 40 mA max.)



E5CK-T

Controller with Voltage Output (12 VDC, 20 mA max.)

See the following table.

Model	G3PA/G3PB	G3NH	G3NA	G3NE	G3B
Appear-ance					
SSRs connected in parallel	E5AK-/E5EK-T: 8 pcs. E5CK-T: 4 pcs.	E5AK-/E5EK-T: 8 pcs. E5CK-T: 4 pcs.	E5AK-/E5EK-T: 5 pcs. E5CK-T: 2 pcs.	E5AK-/E5EK-T: 2 pcs. E5CK-T: 1 piece	E5AK-/E5EK-T: 5 pcs. E5CK-T: 2 pcs.
Rated input voltage	5 to 24 VDC	5 to 24 VDC	5 to 24 VDC	12 VDC	5 to 24 VDC
Features	Thin, SSR with built-in heat sink; 1-phase and 3-phase models	For high-power heater control	Standard model with screw terminals	Compact, low-cost model with tab termi-nals	Socket, model with 5-A switching capacity

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